These requirements replace those contained in the October 2003 EM 385-1-1, Sections 19.A.07.h (1), (2), & (3) and 19.B.01.c

19.G MARINE FALL PROTECTION SYSTEMS

19.G.01 On all decks or work surfaces 6 feet (1.8 m) or more above the main deck or 6 feet (1.8 m) or more above adjacent vessel decks, docks, or other hard surfaces, Railing Type A or Type B, as described in Section 19.I., or bulwarks, coamings, or other structures meeting the height and strength requirements of these railing systems shall be provided.

19.G.02 Deck edge toe boards not less than 3.5 inches (8.75 cm) high for Type A and 2 inches (5 cm) high for Type B railings shall be provided when the railings are used for fall protection. Toe boards shall meet the strength requirements in section 21.B.02.d. Scuppers and/ or drainage holes may be installed as needed as long as the top edge of the toeboard is intact and the strength requirements are retained.

19.G.03 Personal Fall Protection Systems meeting the requirements of Section 21.C. may be used when the use of railing systems is impractical.

19.H MAIN DECK PERIMETER PROTECTION

> ***NOTE: These requirements for perimeter protection are new as of March 2007 and shall be implemented as soon as practical, but due to the time and expense needed to comply, the following implementation schedule may be followed:***
>
> ***a. Vessels with no existing main deck perimeter protection shall have railings installed, where identified below, not later than 18 months after the publication of this interim standard on the USACE Website.***
>
> ***b. Existing main deck perimeter protection shall be retrofitted as needed to meet the design and construction parameters of this standard not later than 36 months after the publication of this interim standard on the USACE Website.***
>
> ***c. New vessels built or purchased for USACE use later than 3 months after the publication of this interim standard on the USACE website shall meet these requirements upon delivery or prior to first use. Vessels delivered within the 3-month period shall be properly outfitted as soon as possible, but not later than the timelines listed in a. and b. of this note.***

19.H.01 Main deck perimeter protection systems are intended to provide protection against falling overboard. Main deck perimeter protection is required on all manned vessels. The Design parameters for the different types of main deck railing systems listed in this section are in Section 19.I. unless noted otherwise.

a. Manned vessels are vessels that operate with crews, or quartered personnel, or that have work areas that are occupied by assigned personnel during normal work activities.

b. Unmanned vessels are those that carry cargo such as materials, supplies, equipment, or liquids, and do not have personnel on board during normal operations.

19.H.02 Manned vessels over 26 feet (7.9 m) in length operating in unprotected or partially protected waters (as defined in 46 CFR) shall have Type B Railings provided around the deck edge.

19.H.03 Manned vessels over 26 feet (7.9 m) in length operating in rivers or protected waters shall have Type B or Type C Railings provided around the deck edge.

19.H.04 Type D Grab rails shall be provided on all manned vessels in the following instances:

a. On deckhouses or other similar permanent structures more than 48 inches (1.23m) from deck edge rail systems.

b. On deck houses or similar permanent structures that are within 8 feet (2.46m) of the deck edge in areas where the deck edge rail has been omitted or may be temporarily removed in accordance with 19.H.05.

19.H.05 The following are main deck areas where perimeter protection may be omitted or temporarily removed:

a. Deck work areas specifically intended for line handling or load handling operations and for boarding areas. Railings in these areas may obstruct work or access and present additional hazards such as pinch points against railings. In these areas, the deck edge rail may be temporarily removed or omitted entirely, depending on the frequency of such operations. Removable railings shall be maintained in place when vessel operations do not include activity in the affected deck work areas, or during periods of tie-up or inactivity.

b. Main Deck Perimeter protection is not required for unmanned vessels. Fall protection shall be provided on unmanned vessels where the vessel configuration and operation exposes personnel to falls onto a hard surface from vertical distances greater than 6 feet (1.8 m).

c. Deck perimeter rails may be omitted from main deck areas where the overall walkway width is less than 24 in (.6 m) between deck structures/ permanent equipment and the deck edge.

19.H.06 When deck edge perimeter protection is not present, standard operating procedures, Activity Hazard Analyses, or other documents shall be developed to address the hazards involved. These documents shall be reviewed by all crew during initial orientation and at regular intervals afterward. The following operational procedures shall be followed:

a. PFD's must be worn by personnel in the unprotected area(s) and only crew involved in work activities shall be allowed in the area. Such areas may be used by crew to transit or access areas of the boat, but when doing so, all other requirements of this section must be met. Areas where railings are removed shall be blocked off from access by a suitable barrier, or shall be clearly marked as PFD- required areas by signage, deck markings, or other means.

b. Continuous sight and verbal/ radio contact shall be maintained between personnel in the non-protected deck perimeter areas and the vessel operator or a designated crew member who is in sight and verbal/ radio contact with the operator, and who will monitor the workers in the area.

c. A safety skiff or equivalent rescue vessel shall be readily available throughout the duration of these activities in accordance with 05.I.

19.H.07 Small boats with length 26 feet (7.9 m) or less shall be provided with integrated combinations of:

- Cockpits,
- Coamings,
- Handholds,
- Toe Rails,
- Life Rails,
- Deck Rails,
- Stern Rails and Bow Rails.

a. These installations, taken together, shall provide continuous perimeter protection around the vessel. The installations shall be in accordance with either ABYC Standards or ISO Standard 15085, as demonstrated by a Manufacturer's certificate, label or other documentation.

19.I MARINE RAILING TYPES

19.I.01 Railings used on vessels may be provided in the types (A, B, C, & D) provided below. Specific requirements for the vessel types and areas where the

various railing types may be provided are delineated in sections 19.G and 19.H. Illustrations of each type can be found in Appendix U of this manual.

19.I.02 Railing Type A – Two Tier Rigid Fall Protection Rail. This railing is comprised of rigid vertical stanchions and two rigid horizontal tiers in accordance with section 21.B.01. Minimum top rail height is 42 inches +/- 3 inches (106.6 cm +/- 7.6 cm) and the lower rail horizontal tier is at half height.

19.I.03 Railing Type B – Three Tier Marine Rigid or Tensioned Railing. This railing is comprised of rigid vertical stanchions and three rigid or tensioned horizontal tiers. The following parameters apply:

a. Clear spacing between the tiers shall be no greater than 9 inches (22.8 cm), 15 inches (38 cm) and 15 inches (38 cm) respectively. The 9 inch (22.8 cm) space is closest to the deck surface. Minimum height from deck to the top tier may not be less than 39 inches (99 cm).

b. The 9 inch (22.8 cm), 15 inch (38 cm), and 15 inch (38 cm) clear tier spacing above may not be exceeded.

c. The bottom tier may be omitted in way of deck fittings or in order to facilitate line handling. The space resulting from the removed lower tier may not extend more than 2 feet (60.8 cm) beyond either side of the deck fitting.

d. Vertical stanchions may be pipe or structural sections. Horizontal tiers may be constructed from rigid (pipe or structural sections) or non rigid (wire rope or chain) components, or from combinations of these components. Non rigid tiers must be tensioned with turnbuckles or similar components.

e. Railings may be either fixed or removable in sections. All rail vertical stanchions must be adequate to withstand 200 pound (60.9 kg) load applied horizontally at the top of the stanchion. Stanchion spacing may not exceed 8 feet (2.4 m).

f. Pipe or structural section rail components shall be sized appropriately to meet the performance criteria of 21.B.02.

g. Chain or wire rope together with all connecting fittings shall have minimum breaking strength of 4,000 pounds (1814.3 kg).

h. Chain or wire rope horizontal tiers shall be tensioned so that:

(1) there is no slack,

(2) sag does not exceed 1/4 inch (.625 cm) at any point between stanchions, and

(3) the lowest point from deck to the top of the upper rail may not be less than 39 inches (99 cm) at any point between the stanchions. Tensioned railing tiers shall not deflect more than 1 inch (2.5 cm) under a load of 200 pounds (60.9 kg).

i. Solid bulwarks or coamings providing equal perimeter protection to a height of 39 inches (99 cm) may also be provided. Bulwarks may be constructed of structural plate and shapes. Bulwarks must meet all strength/deflection/open spacing requirements presented above for railings.

19.I.04 Railing Type C – Non-Tensioned Railings and Flexible or Swing-Away Railings shall consist of rigid vertical stanchions with horizontal non-tensioned chain, wire rope or rigid tiers that clip to the verticals.

a. Non-Tensioned Railings shall consist of horizontal tiers constructed from chain, wire rope, pipe or structural sections or combinations of these components. Vertical stanchions shall be pipe or structural sections. Vertical support spacing shall not exceed 8 feet (2.4 m).

b. Flexible or Swing-Away Rails shall consist of chain or wire rope tensioned vertical support lines with non-tensioned chain, wire rope or clip-on rigid horizontal tiers. Vertical support line spacing shall not exceed 6 feet (1.8 m).

c. Pipe or structural section rail components shall be sized appropriately to meet the performance criteria of 21.B.02. Chain or wire rope together with all connecting fittings shall have minimum breaking strength of 4,000 pounds (1800 kg).

d. For Non-Tensioned Railings and Flexible or Swing-Away Railings, sag of horizontal tiers shall not exceed 4 inches (10 cm) between vertical supports.

e. Non-Tensioned Railings and Flexible or Swing-Away Railings shall be configured with four or more horizontal tiers. The number of horizontal tiers shall be sufficient to meet the following requirements:

1) Effective clear spacing between the deck and bottom tier shall be no greater than 9 inches (22.8 cm).

2) Effective clear spacing between all tiers above the bottom tier shall be no greater than 15 inches (38.1 cm).

3) Effective minimum height from deck to the top tier may not be less than 39 inches (99 cm).

f. The effective tier spacing identified above includes the effect of the increased spacing associated with sag in the tiers, applied either up or down. Clear spacing measurements shall be made with the railing tiers spread to form the largest opening.

g. Railing height is reduced by the amount of sag in the tiers. Railing minimum height shall be measured at the lowest point in the rail.

h. The bottom tier may be omitted in way of deck fittings or in order to facilitate line handling. The space caused by the removed lower tier may not extend more than 2 feet (60.8 cm) beyond either side of the deck fitting.

i. The top tier may not deflect to a height less than 39 inches (99 cm) above the deck under a force of 200 pounds (60.9 kg), applied vertically. In addition, the top tier may not deflect more than 12 inches (30.4 cm) horizontally under a force of 200 pounds (60.9 kg) applied horizontally.

j. Tensioning springs in the vertical support lines, if provided, must be of the compression with drawbar type.

19.I.05 Railing Type D – Grab Rails are railing sections mounted to deckhouse sides or to the sides of other permanent structures.

a. Grab rail height shall match the height of the deck top rail/tier. Where there is no top rail near the grab rail, grab rail height shall be 39 inches (99 cm).

b. Grab rail strength shall be adequate to withstand a 200 pound (60.9 kg) load applied in any direction.

c. Grab rails shall be sized dimensionally comparable to 1.5 inch (3.8 cm) pipe. Clear distance between the rail and house side may not be less than 3 inches (7.6 cm).